REMARKS

Claims 1 - 20 are presently pending in this Application. With respect to the Claims, the following amendments are presented above:

(a) independent Claim 1 - has been amended to further and/or better define the Applicant's invention, as claimed, by the addition of the following step (c):

> "providing a set-up period to permit the gelant to set to form a gel block in the formation and to permit the temporarily stable foam to break down to permit the passage of gas through the foam into the wellbore."

Support for the amendment to Claim 1 is found in the Application as filed at: Page 6, lines 1 - 8; and Page 19, lines 14 - 19;

(b) dependent Claims 7, 11 and 13 - have been amended to further define the molecular weight of the polymer, as claimed.

Support for the amendments to Claims 7, 11 and 13 is found in the Application as filed at: Page 8, line 32 - Page 9, line 3; Page 9, lines 18 - 23; and Page 21, lines 18 - 25;

(c) dependent Claims 19 and 20 - have been amended to better define the "effective viscosity" as the "viscosity in situ."

Support for the amendments to Claims 19 and 20 is found in the Application as filed at: Page 12, lines 19 - 24; and Page 24, lines 32 - 33; and

(d) dependent Claims 21 - 24 - have been added to further and / or better define the Applicant's invention as claimed, and particularly relate to the "temporarily stable foam."

Support for new Claims 21 - 24 is found in the Application as filed at: Page 11, lines 27 - 33; Page 12, lines 1 - 4; Page 12, lines 14 - 17; Page 24, lines 9 - 13; and Page 24, lines 15 - 22.

Referring to the Office Action, the Examiner has rejected the following Claims pursuant to 35 U.S.C. 112, 2nd paragraph, as being indefinite:

(a) Claims 1 - 20 - are rejected for being indefinite, and particularly for use of the term "temporarily" in Claim 1 which is considered to be a relative term.

In response, it is respectfully submitted that the "temporarily stable foam", as claimed in amended Claim 1, has been specifically defined in the Application, as filed, at: Page 11, lines 15 - 25; Page 17, lines 24 - 26; and Page 18, line 33 - Page 19, line 2. Further, Page 23, lines 23 - 33 states:

> "A temporarily stable foam is a foam having sufficient stability to act upon and push the gelant such that the gelant is displaced from the wellbore (22) into the formation (24), while also being capable of collapsing, breaking down or de-stabilizing following the overdisplacement of gelant. The foam must be able to breakdown sufficiently to provide reasonable permeability through the foam. More particularly, the foam breaks down or otherwise de-stabilizes to establish pathways or channels through the foam such that the gas (26) in the formation (24) is provided access to the wellbore (22)."

Furthermore, Claim 1 has been further amended by the addition of step (c) wherein a set-up period is provided "to permit the temporarily stable foam to break down to permit the passage of gas through the foam into the wellbore."

Thus, it is respectfully submitted that the use of the term "temporarily" in specific reference to the foam does not render the Claim indefinite.

(b) Claims 11 and 13 - are rejected for being indefinite, and particularly for use of the terms "relatively high" and "relatively low" which are considered to be relative terms. The term "relatively high" is also found in Claim 7.

In response, Claims 7, 11 and 13 have been amended to particularly provide for the molecular weights as defined in the Application at: Page 8, line 32 – Page 9, line 3; Page 9, lines 18 – 23; and Page 21, lines 18 – 25.

Specifically, a "relatively high" molecular weight polyacrylamide is now defined as "a polyacrylamide having a molecular weight of greater than about 1,000,000", while a "relatively low" molecular weight polyacrylamide is defined as "a polyacrylamide having a molecular weight of less than or equal to about 1,000,000."

(c) Claims 19 and 20 - are rejected for being indefinite, and particularly for use of the term "effective" which is considered to be a relative term. Specifically, each of these Claims refers to the "gelant effective viscosity" and the "foam effective viscosity."

Pursuant to Page 12, lines 19 – 24 and Page 24, lines 32 – 33 of the Application, the "effective viscosity" is defined as "the viscosity in situ or in the wellbore." Thus, Claims 19 – 20 have been amended to claim "a gelant viscosity in situ" and "a foam viscosity in situ."

It is respectfully submitted that each of the rejections of the Claims for being indefinite has been fully addressed and overcome as set out above.

Referring further to the Office Action, the Examiner has rejected the following Claims under 35 U.S.C. 103(a) as being unpatentable over the cited references:

(a) **Claims 1, 2 and 14 – 20** – are rejected for being unpatentable over U.S. Patent 6,439,308 to Wang in view of U.S. Patent 5,944,106 to Dalrymple et al.; and

(b) **Claims 3 – 13** – are rejected for being unpatentable over Wang in view of Dalrymple et al. and further in view of U.S. Patent 4,683,949 to Sydansk et al.

It is respectfully submitted that each of these rejections of the Examiner are overcome by the amendment to independent Claim 1 and the remarks that follow.

Applicant's Invention

The Applicants' invention as claimed in **amended independent Claim 1** is directed at a method of reducing water influx into a wellbore, comprising the following steps:

(a) first introducing a gelant into the wellbore, wherein the wellbore is in fluid communication with a subterranean formation;

(b) second introducing a temporarily stable foam into the wellbore **in order to overdisplace the gelant from the wellbore and into the formation**; and

(c) providing a set-up period to permit the gelant to set to form a gel block in the formation and **to permit the temporarily stable foam to break down to permit the passage of gas through the foam into the wellbore**.

As claimed, the method includes the step of first introducing a gelant into the wellbore and second introducing a temporarily stable foam into the wellbore in order to overdisplace the gelant from the wellbore and into the formation. "Overdisplacement" is defined in the Application at Page 5, lines 18 - 32 and Page 18, lines 13 - 24, as follows:

> "Overdisplacement of the gelant into the formation refers to the movement or displacement of the gelant from the wellbore through which it is initially introduced and away from the near wellbore region into the surrounding formation. … Further, the overdisplacement is performed in order that the gelant, when set to provide a gel plug or gel block, blocks or inhibits water influx into the wellbore from the water producing zone while not substantially interfering with or hindering gas flow to the wellbore from the gas producing zone or layer of the formation. Further, the overdisplacement is performed in order to provide the temporarily stable foam in the wellbore and the near wellbore region for subsequent collapse or breakdown, as described below. In the event the gelant is not overdisplaced, or is not overdisplaced sufficiently, the resulting gel block will block or prevent both gas and water flow to the wellbore and shut-off the wellbore completely."
>
> "More particularly, in each particular circumstance, the gelant is required to be displaced sufficiently into the formation (24) and away from the near wellbore region of the wellbore (22) to permit the gas (26) to subsequently access the wellbore (22) while inhibiting or reducing the flow of water (20) to the wellbore (22). Thus, the foam must overdisplace the gelant a sufficient distance from the

wellbore (22) to permit the establishment of the necessary gas pathways or channels through the foam upon the subsequent breakdown, collapse or de-stabilization of the temporarily stable foam. … In other words, the overdisplacement is performed sufficiently in order that the set gel block (28) inhibits the water influx from the water producing zone or layer of the formation (24), while the de-stabilized foam permits or provides for gas flow to the wellbore (22) from the gas producing zone or layer of the formation (24).

Finally, the method includes "providing a set-up period" as described in the Application at Page 6, lines 1 - 8 and Page 19, lines 14 - 19 as follows:

"Following the second introducing step, a period of time is permitted to pass which is sufficient to permit the gelant to gel or set up to form the desired gel block in the formation for inhibiting or preventing the flow of water and which is sufficient to permit the temporarily stable foam to break down, collapse or de-stabilize in order to provide a passageway or channel for the flow of the gas through the foam. This period of time, referred to as the shut-in period, may be several hours or several days or more depending upon the specific composition of the gelant and the foam. Following the shut-in period, there has been found to be an improved water blocking efficiency and a resulting enhanced gas recovery."

"Following the second introducing step, a period of time is permitted to pass which is referred to as the set-up period. The set-up period may vary from several hours or several days or more depending upon the specific composition of the gelant and the foam. The set-up period is provided to permit the gelant to gel or set to form the desired gel block (28) in the formation (24) to block the passage of water and to permit the temporarily stable foam to break down, collapse or de-stabilize in order to permit the passage of gas through the foam."

It is respectfully submitted that none of the references cited by the Examiner discuss or disclose either "second introducing a temporarily stable foam into the wellbore in order to overdisplace the gelant from the wellbore and into the formation" or "providing a set-up period to permit the gelant to set to form a gel block in the formation and to permit the temporarily stable foam to break down to permit the passage of gas through the foam into the wellbore" as claimed in amended independent Claim 1.

Furthermore, it is respectfully submitted that none of the cited references disclose the particular composition of the "temporarily stable foam" as claimed in new Claims 21 - 24.

Obviousness (Wang in view of Dalrymple et. al.)

As stated, the Examiner has rejected independent **Claim 1** and dependent **Claims 2 and 14 - 20** for being unpatentable over Wang in view of Dalrymple et. al.

As discussed in *KSR International Co. v. Teleflex Inc.,* 82 USPQ2d 1385 (2007), the determination of obviousness under 35 U.S.C. 103 is a legal conclusion based on factual evidence. The legal conclusion that a claim is obvious depends upon at least four underlying factual issues, as set forth in *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1 (1966): (1) the scope and content of the prior art; (2) differences between the prior art and the claims at issue; (3) the level of ordinary skill in the pertinent art; and (4) evaluation of any relevant secondary considerations.

Therefore, the test for obviousness must take into consideration the invention as a whole; that is, one must consider the particular problem solved by the combination of elements that define the invention. *Interconnect Planning Corp. v. Feil*, 227 USPQ 543 (Fed. Cir. 1985); *Manual of Patent Examining Procedure* §2143.02. The Examiner must, as one of the inquiries pertinent to any obviousness inquiry under 35 U.S.C. 103 recognize and consider not only the similarities but also the critical differences between the claimed invention and the prior art. *In re Bond,* 15 USPQ2d 1566 (Fed. Cir. 1990).

The fact that a reference teaches away from a claimed invention is highly probative that the reference would not have rendered the claimed invention obvious to one of ordinary skill in the art. *Stranco Inc. v. Atlantes Chemical Systems, Inc.*, 15 USPQ2d 1704 (Tex. 1990).

Moreover, the Examiner must avoid hindsight. The fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggest the desirability of the combination. *Manual of Patent Examining Procedure* §2143.01

The Federal Circuit stated in *In re Kotzab*, 55 USPQ2d 1313 (Fed. Cir. 2000) that:

> "…to establish obviousness based on a combination of elements…there must be some motivation, suggestion or teaching of the desirability of making the specific combination that was made by the applicant…There must be a showing of a suggestion or motivation to modify the teachings of that reference…"

Wang is directed at a foam drive method for enhancing oil recovery from a subterranean oil-bearing formation. The method includes "injecting into the formation an aqueous polymer solution as a preceding-slug." The method further includes "periodically injecting … a non-condensible gas and an aqueous solution of foaming composition to form a combined foam under ground or periodically injecting the combined foam formed beforehand by the gas and said aqueous solution above ground…" Thereafter, a further aqueous polymer solution is injected as a "protecting-slug," followed by continuing water-flooding of the formation. (Column 2, lines 40 - 62; and Column 4, lines 33 - 41 of Wang).

As indicated, the preceding-slug of the aqueous polymer solution is first injected into the oil-bearing formation to preferentially enter the high permeability zone and/or the thief zone and to reduce its permeability. The second injecting step is performed after the preceding-slug is injected into the formation. (Column 3, lines 18 - 26 and lines 38 - 40 of Wang).

Thus, the preceding-slug is injected into the formation prior to the subsequent injecting step. There is no discussion provided by Wang regarding the introducing of the preceding-slug into the wellbore, and the subsequent injecting of the combined foam in order to overdisplace the preceding-slug from the wellbore and into the formation (as claimed by the Applicant in amended Claim 1). Rather, as stated, the preceding-slug has already been injected into the formation prior to the subsequent injecting step of Wang.

With respect to the aqueous solution of the "foaming composition" of Wang, the foaming composition comprises an alkali, a surfactant and a polymer which form a "combined foam." More particularly, the foaming composition is preferably comprised of 0.5 to 1.5 % by weight of the alkali, 0.05 to 0.5 % by weight of the surfactant and 0.05 to 0.5 % by weight of the polymer. (Column 3, lines 41 - 43; Column 3, lines 57 - 59; and Column 4, lines 7 - 11 of Wang).

As claimed by the Applicant in new Claim 21, the "temporarily stable foam" consists essentially of water and a surfactant. The foaming composition of Wang clearly requires an alkali, a surfactant and a polymer. No other composition of the "foaming composition" is described or suggested by Wang.

Furthermore, as claimed by the Applicant in new Claim 24, the concentration of the surfactant in the foam is less than about 0.05 % by weight of the foam. The foaming composition of Wang clearly requires the concentration of the surfactant in the foaming composition to be 0.05 to 0.5 % by weight of the foaming composition. Wang does not describe or suggest any other concentrations of the surfactant that may be used.

In addition, Wang states that the "combined foam drive process" results in a mechanism in which "the formed foam preferentially enters and **plugs** high permeability pores which are present in the subterranean formation" (Column 4, lines 53 - 56 of Wang). Further, Wang states that the polymer included in the "three component" foam (i.e. the foaming composition forming the combined foam) acts to **stabilize** the formed foam, wherein "the more the amount of the polymer" … "the better the foam stability" (Column 5, lines 1 - 3 and lines 19 - 22 of Wang).

Clearly, the foaming composition and resulting combined foam of Wang are intended **to plug the high permeability pores**. In this regard, Wang further describes the injecting of a further aqueous polymer solution as a "protecting-slug," followed by continuing water-flooding of the formation. Specifically, the protecting slug "aims at protecting efficiently the formed foam and at decreasing the diluting action of the follow-up water drive on the foam." (Column 4, lines 33 - 38 of Wang).

There is no discussion in Wang regarding the breakdown or de-stabilization of the combined foam over time, or the desirability of such breakdown or de-stabilization for any purpose. Rather, as indicated, steps are actively taken (by the injection of the protecting slug) to protect against any breakdown or dilution of the combined foam. **The combined foam is intended to provide a complete blockage in a high permeability zone or thief zone in the formation**.

As claimed by the Applicant in Claim 1, the method includes "providing a set-up period to permit the gelant to set to form a gel block in the formation and to permit the temporarily stable foam to break down **to permit the passage of gas through the foam into the wellbore**."

In clear contrast, Wang does not describe or suggest the provision of a "**set-up period**" as claimed by the Applicant. Furthermore, Wang does not describe or suggest the features of the "set-up period" as claimed.

As described previously, the Applicant's method is directed at reducing water influx into a wellbore. However, the water influx is required to be reduced, while still permitting production from a gas producing formation or gas reservoir through the wellbore (Page 1. lines 5 - 9; Page 14, lines 3 - 34; and Page 18, line 26 - Page 19, line 12 of the Application). As stated in the Application:

> "The overdisplaced gelant results in a gel block (28) which prevents or reduces the water influx, while the foam de-stabilizes to generate one or more channels or gas pathways for the gas (26) to flow back into the wellbore (22) along the upper part or portion of the fractures." (see Figure 1 of the Application)
>
> "The gel block (28) or gel layer is positioned above the bottom water layer to prevent or reduce water influx, while the de-stabilized foam generates one or more channels or gas pathways for the gas (26) from the upper gas layer to flow back into the wellbore (22)." (see Figure 2 of the Application)

Thus, the Applicant's claimed "set-up period" permits "the gelant to set to form a gel block in the formation" and permits "the temporarily stable foam to break down to permit the passage of gas through the foam into the wellbore."

In contrast, the preceding-slug of Wang does not form a gel block in the formation. The preceding-slug simply reduces the permeability of the formation to enhance the subsequent injection of the foam. Rather, the combined foam in Wang forms the blockage in the formation. The combined foam is not intended to breakdown or destabilize to permit the passage of gas through the foam into the wellbore. In fact, specific steps are taken in Wang to prevent any such breakdown.

Thus, it is respectfully submitted that all of the features of the Applicant's invention, as claimed in amended Claim 1, are not disclosed or suggested in any manner by Wang. Furthermore, it is submitted that these features are also not disclosed or suggested by Dalrymple et. al. Accordingly, combining Dalrymple et. al. with Wang does not overcome the deficiencies of Wang as outlined above.

Dalrymple et al. describes a method for reducing the amount of water produced from a subterranean formation. However, Dalrymple et al. does not describe the use of any foam or foam composition whatsoever in the performance of the method.

The method of Dalrymple et. al. includes introducing a gelled fluid into a wellbore at a rate and pressure sufficient to fracture the formation. The gelled fluid is comprised of a first reactive polymer and a second reactive polymer which react in situ. The introduction of the gelled fluid is followed by introducing a cross-linked gelled fluid to extend the fractures into the subterranean formation and to transport proppant into the fractures. The well is then shut-in for a sufficient period of time to permit in situ polymerization to occur. (Column 1, line 57 - Column 2, line 4; Column 2, lines 25 - 30; and Column 4, lines 19 - 25 of Dalrymple et. al.).

During the shut-in period of Dalrymple et al. the gelled and cross-linked fluids "are caused to break, i.e., revert to a thin fluid which can be reverse flowed out of the fractures leaving proppant therein. Production of hydrocarbons then may be initiated from the treated subterranean formations." Furthermore, the reaction product of the polymers is described as selectively reducing the permeability of the subterranean formation to water. (Column 6, lines 7 - 26; Column 7, lines 34 - 37 and lines 60 - 64; Column 8, lines 63 - 67; and Column 10, lines 30 - 35 of Dalrymple et. al.).

The Examiner appears to have cited Dalrymple et al. as showing the teaching of a method for reducing the permeability of a high permeability zone in order to reduce water influx into a wellbore. However, Dalrymple et al. is otherwise completely irrelevant and unrelated to the Applicant's claimed invention and to the invention of Wang.

Thus, in summary, it is submitted that neither of these references teach or suggest all of the claim limitations of amended independent Claim 1, and in particular:

(b) second introducing a temporarily stable foam into the wellbore in order to **overdisplace** the gelant from the wellbore and into the formation; and

(c) providing a set-up period **to permit the gelant to set to form a gel block in the formation** and **to permit the temporarily stable foam to break down to permit the passage of gas through the foam into the wellbore**.

Given that neither of the references disclose these features of amended Claim 1, it is respectfully submitted that it would not have been obvious to combine the references in the manner set forth by the Examiner in order to provide the Applicant's invention. Rather, there are "critical differences" between the claimed invention and the prior art with respect to both the claimed features and the function or purpose of the claimed method.

Furthermore, a person having ordinary skill in the art would not combine the references as suggested by the Examiner. Specifically, Wang provides a combined foam within the formation which acts to provide a complete blockage of the high permeability zones to improve the subsequent performance of the enhanced oil recovery process comprising water flooding. Steps are taken to protect the combined foam from breakdown or dilution during the subsequent water flooding process.

In contrast, Dalrymple et. al. desires in situ polymerization to occur such that the gelled and cross-linked fluids "are caused to break" and to revert to a thin fluid which can be reverse flowed out of the fractures leaving proppant therein. Furthermore, the reaction product of the polymers is described as selectively reducing the permeability of the subterranean formation to water. In other words, a complete blockage of the fractured zone is not desirable.

As a result, it is submitted that there is no motivation or suggestion provided to modify the teachings of Wang in light of Dalrymple et. al. In fact, it is submitted that one having ordinary skill in the art would be led away from combining these references given the distinctions between the references and the function or purpose of the "combined foam" of Wang as compared with the "reaction product" of Dalrymple et. al.

Obviousness (Wang in view of Dalrymple et. al. and Sydansk et. al.)

As stated, the Examiner has further rejected dependent **Claims 3 - 13** for being unpatentable over Wang in view of Dalrymple et. al. and further in view of Sydansk et. al.

Each of these dependent Claims depends directly or indirectly from amended Claim 1. Thus, it is respectfully submitted that these rejections are overcome by the amendment to Claim 1, the previous remarks and the remarks that follow.

Sydansk et al. describes the use of a gel comprised of a high molecular weight polyacrylamide and a cross-linker. The gel components are combined at the surface and injected into the desired treatment zone via a wellbore to form a continuous single-phase gel which substantially reduces permeability in the treatment zone. (Column 2, lines 6 - 18 of Sydansk et. al.).

Thus, Sydansk et al. is relevant to step (a) of the Applicant's amended Claim 1 only. In particular, the gel of Sydansk et al. is relevant only to the Applicant's "gelant" which is first introduced into the wellbore.

Sydansk et al. does not describe or suggest in any manner whatsoever steps (b) or (c) of Claim 1 of the Applicant's method. In particular, Sydansk et al. does not describe or suggest second introducing a temporarily stable foam into the wellbore in order to overdisplace the gelant from the wellbore or providing a set-up period, as claimed.

In other words, Sydansk et. al. is directed at the formation of the "gelant", while the Applicant's method is also directed at the placement of the gelant in the formation. Sydansk et. al. does not discuss or describe the placement of the gelant in the formation, other than to indicate that the gel is injected to the treatment zone.

Steps (b) and (c) of amended Claim 1 of the Applicant's method provide for the correct placement of the gelant in the formation. As claimed, the gelant sets in the formation to form a gel block, which blocks the flow of fluids in the formation. As similar result is achieved in Sydansk et. al. by the gel

However, the Applicant desires that water influx be reduced, while also permitting the flow of gas from the formation into the wellbore. For this reason, the placement of the gelant is provided for by the Applicant's method. Specifically, the gelant is overdisplaced from the

wellbore and into the formation by the foam. Thus, the gelant does not form a gel block within the wellbore, but at a desired location within the formation. In addition, the foam subsequently breaks down to permit the passage of gas through the foam into the wellbore. Thus, once the gelant sets to form the gel block in the formation to reduce water influx, gas is permitted to flow into the wellbore for production to the surface.

As a result, it is respectfully submitted that it would not have been obvious for one of ordinary skill in the art to combine the references to provide the method as claimed in Claims 3 - 13.

Summary –

Thus, in summary, it is respectfully submitted that none of Wang, Dalrymple et. al. and Sydansk et. al., alone or in combination, teach, disclose or suggest the method as claimed in amended independent Claim 1. In particular, it is respectfully submitted that none of the references disclose steps (b) or (c) of amended Claim 1, as discussed in detail above. Therefore, it is respectfully submitted that amended independent Claim 1 is allowable and allowance of Claim 1 is respectfully requested.

Further, dependent Claim 2 - 24 depend directly or indirectly from amended independent Claim 1. Thus, it is respectfully submitted that these dependent Claims are allowable for the distinctions defined therein as well as for the reasons supporting the allowability of Claim 1. Furthermore, none of the references teach, disclose or suggest at least the particular features of dependent Claims 21 and 24. Accordingly, allowance of all of the dependent Claims is also respectfully requested.

In view of the foregoing amendments and remarks, it is submitted that this Application is in condition for allowance and allowance is respectfully requested.

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